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Girard

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[54] **ASSEMBLY FOR BINDING A BOOT TO A GLIDING ELEMENT**

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[51] **Int. Cl.**[7] **A63C 9/18**

[52] **U.S. Cl.** **280/615**; 280/613

[58] **Field of Search** 280/613, 614, 280/615, 634, 631, 632; 36/117.2

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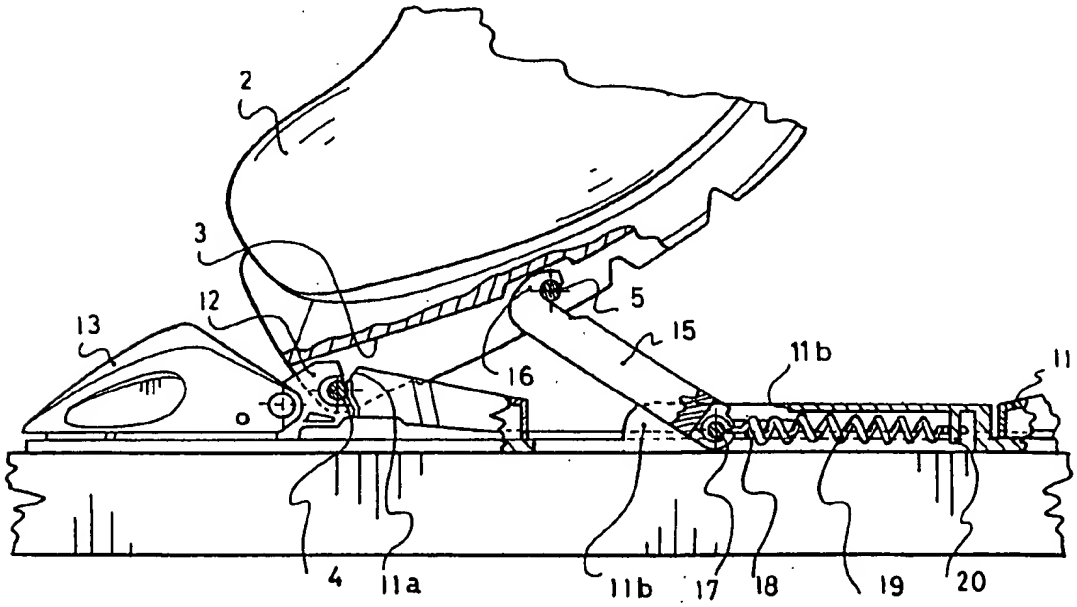
[57] **ABSTRACT**

A boot/binding device apparatus assembly for a boot on a gliding member is of the type including an arrangement for binding the front end of the boot, the rear end of the boot being free to be raised with respect to the gliding member. The assembly includes an arrangement for control and continues elastic return of the boot towards the gliding member, located at the rear of the binding device of the front end of the boot. Advantageously, the control and elastic return arrangement is constituted by an anchoring device for the binding device cooperating with anchoring apparatus associated with the boot, at least one of the anchoring device of the boot or of the binding device being provided with an elastic return mechanism.

19 Claims, 6 Drawing Sheets



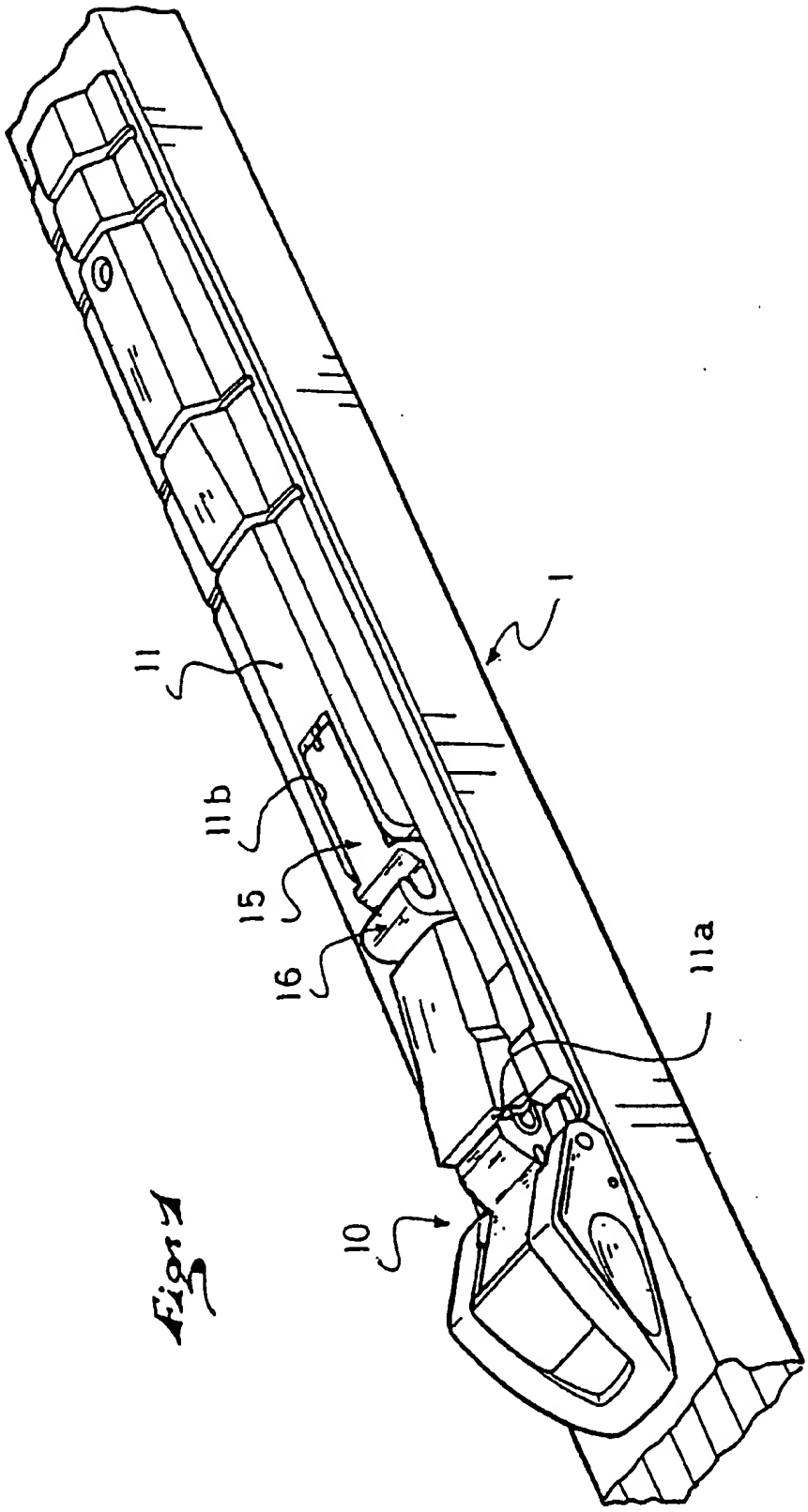


Fig 1

Fig. 2

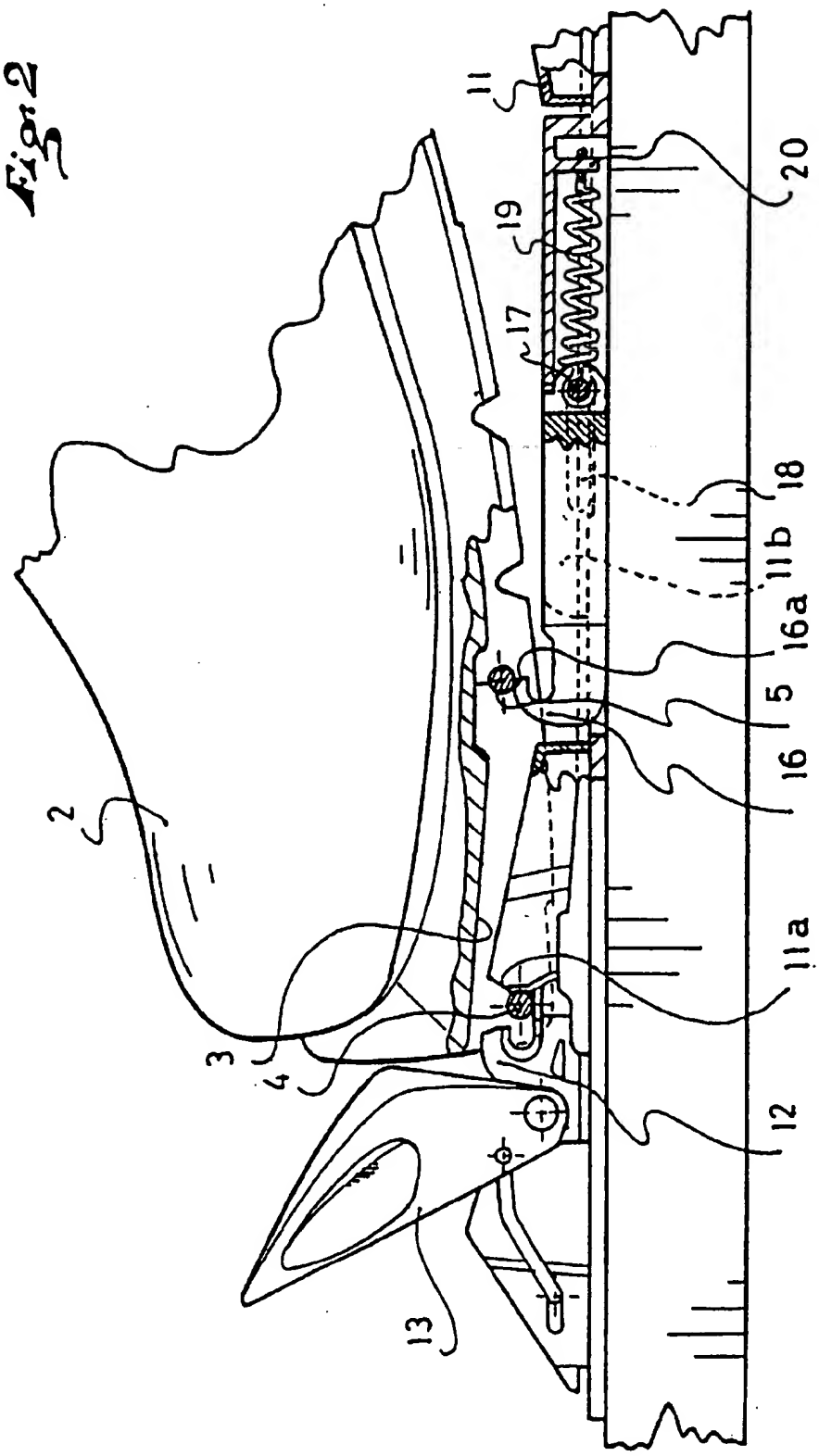


Fig. 3

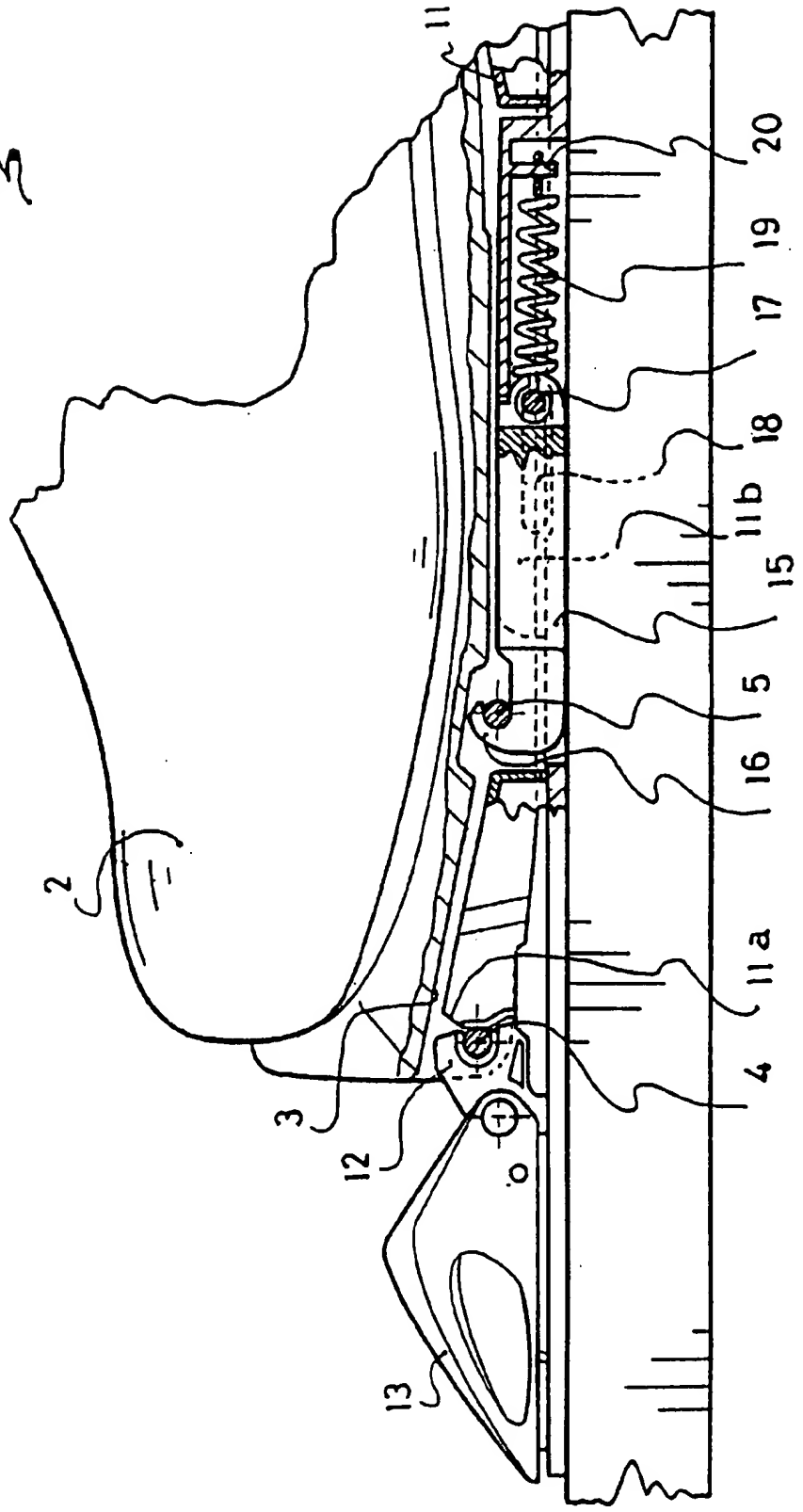


Fig. 4

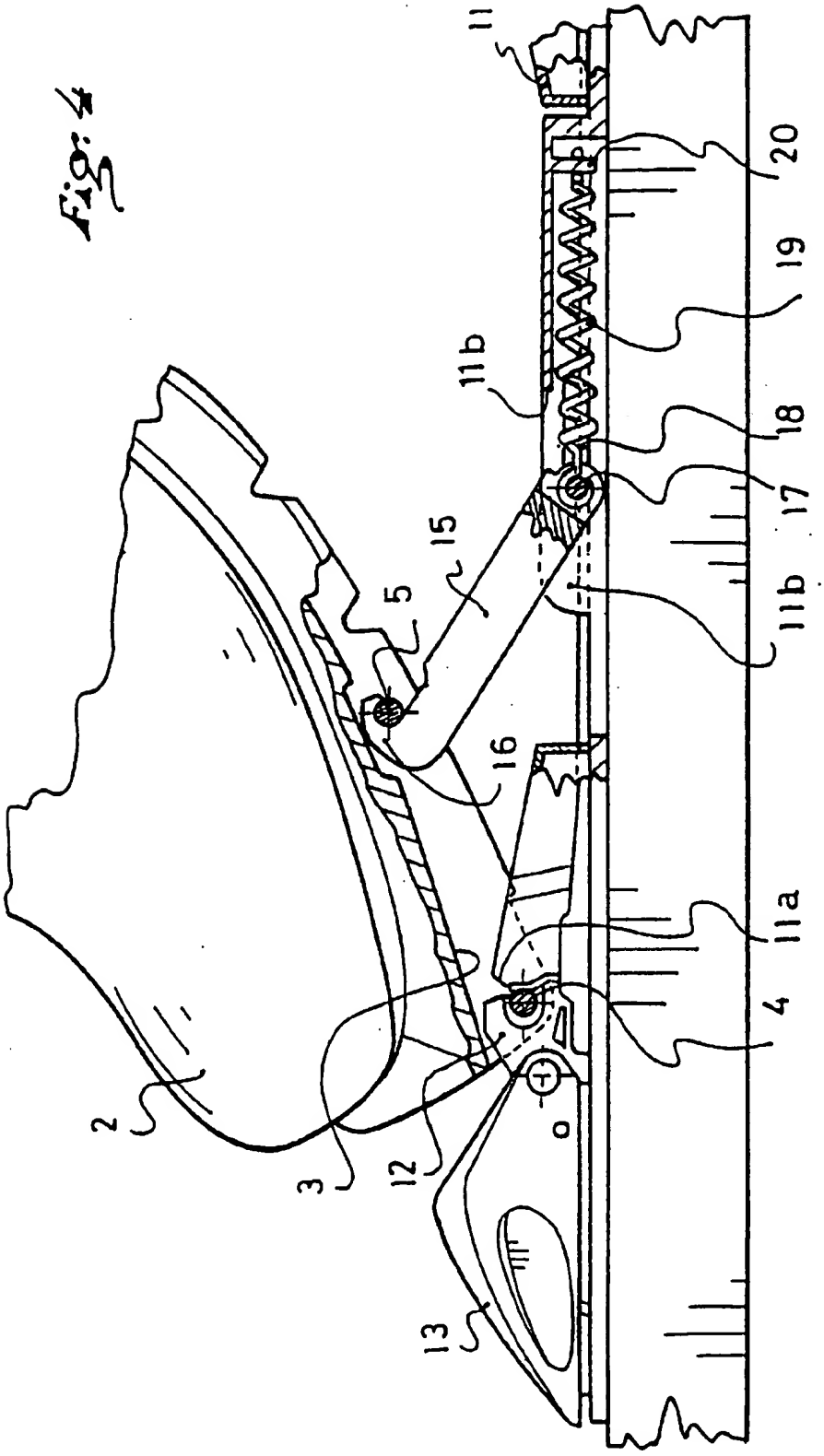
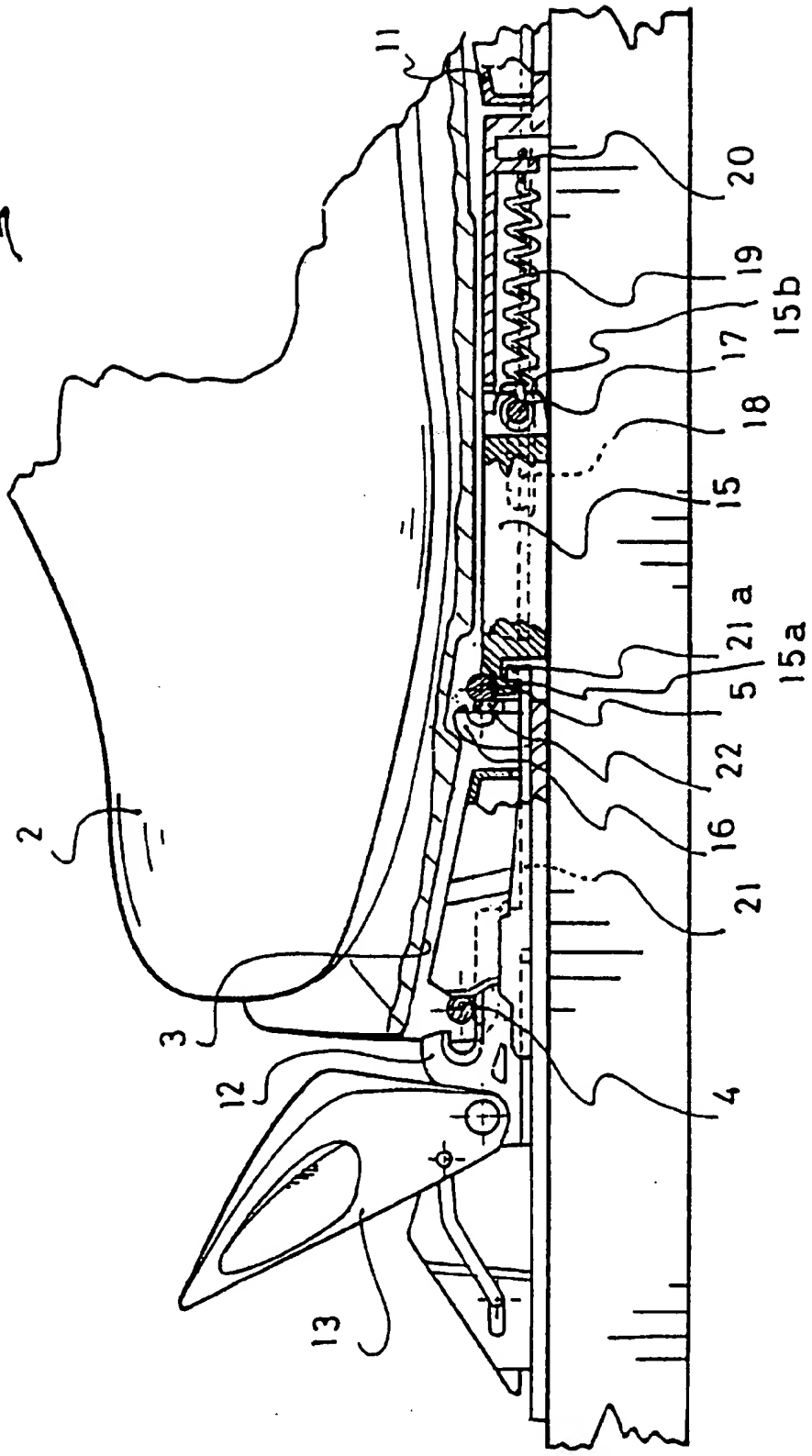


Fig. 5



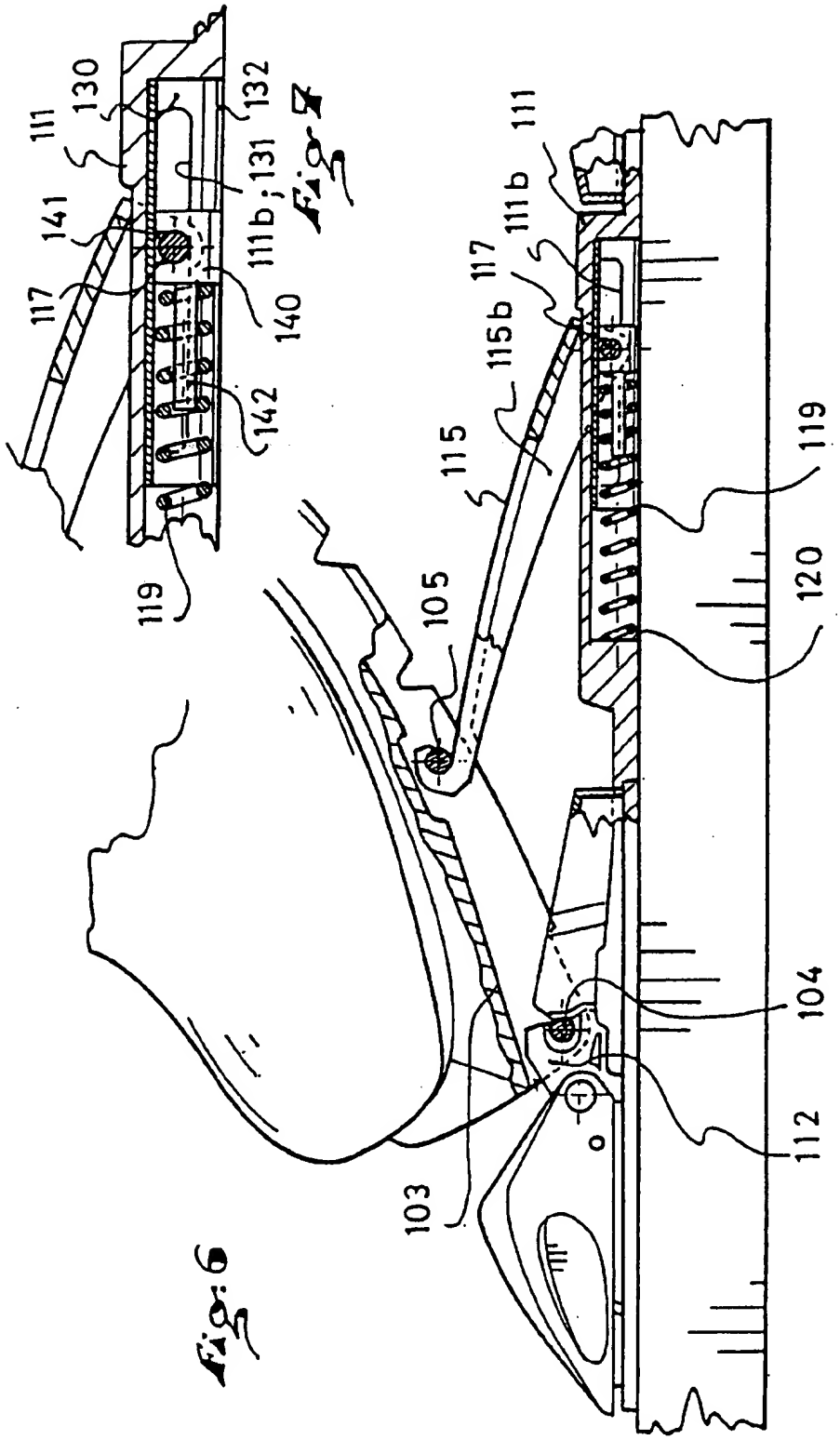

111
130
132
131
111b
141
140
117
142
119
105
115
115b
117
111b
111
119
120
104
112
103

Fig. 6

ASSEMBLY FOR BINDING A BOOT TO A GLIDING ELEMENT

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an assembly for binding a boot to a gliding member, such as a cross country ski, but which can also be constituted by a gliding member such as a snowboard, roller skates, ice skates, etc.

The invention is related more specifically to a binding assembly in which the boot is attached to the gliding member through its front portion, whereby its rear portion, especially the heel zone, remains free so as to allow for a movement of the foot.

2. Background and Material Information

A binding assembly of the above-mentioned type is especially used in cross country skiing where the movement of the foot is essential, both in the so-called conventional techniques and in the skating step.

The problem is to establish a compromise between two totally conflicting requirements, namely:

a maximum movement of the foot, which is necessary for obtaining a large stride amplitude; and

an optimum control and guidance of the ski that, on the contrary, can only be obtained through a continuous "contact" of the foot with such ski.

This compromise has been obtained, until now, by providing a guiding edge which cooperates with the boot, over the entire length of the latter, and by means of an elastic system provided on the binding at the front of the boot and exerting thereon a return force towards the ski.

Such a system enables an important improvement to the guiding of the ski by the boot since the latter remains engaged, almost constantly, with the guiding edge of the ski itself during the lifting of the heel, as long as the metatarsal zone of the boot remains in support on the ski.

On the contrary, once the entire boot is separated from the upper surface of the ski and therefore escapes from the guiding edge, i.e., when in the position of extreme movement of the boot, the latter almost no longer permits any control of the ski. In addition to this problem, a problem of twisting of the boot sole rises as soon as the foot is raised, a twisting that is also detrimental to a good control of the ski.

SUMMARY OF THE INVENTION

The object of the present invention is to remedy these drawbacks and to provide an improved boot/binding assembly on a gliding member, which makes it possible to reconcile two conflicting requirements of maximum movement of the foot and control/guidance of the ski.

This goal is achieved with the boot/binding assembly according to the invention which is of the type comprising means for binding the front end of the boot, the rear end of the boot being free to be raised with respect to the gliding member, because it comprises means of control and permanent elastic return of the boot towards the gliding member, which means are located at the rear of the means for binding the front end of the boot.

In effect, the fact that the elastic return means of the boot are no longer arranged at the front of the boot as usual, but at the rear of the binding means of the front end of the boot, makes it possible to control the boot with respect to the gliding member over the entire zone of the latter, which extends between the binding means of its front end and these elastic return means, even when the boot is in the air and in the position of extreme movement of the boot, which results in an improved control and guidance. Furthermore, the torsional rigidity of the sole, even in the air, is improved since the sole can longer twist, i.e., it can no longer twist over itself, in a zone comprised between the two attachment and control means in succession. Finally, such a construction offers the advantage of not disturbing the flexional deformation of the sole.

Of course, the further these control and elastic return means at the rear, the more substantial the control of the boot will be; however, these control and elastic return means will preferably be located substantially at the level the metatarsophalangeal journal of the boot, this position constituting the compromise between a good control and a minimum space requirement for the binding device.

BRIEF DESCRIPTION OF DRAWINGS

The invention will be better understood and other characteristics thereof will become apparent from the description that follows, with reference to the annexed schematic drawing illustrating two preferred embodiments by way of non-limiting examples, and in which:

FIG. **1** is a perspective view of a binding apparatus according to the invention;

FIG. **2** is a partial longitudinal cross-sectional view of the binding apparatus of FIG. **1** and of an associated boot during fitting of the binding apparatus;

FIG. **3** is a view similar to FIG. **1** in the latched position of the binding apparatus;

FIG. **4** is a view similar to FIG. **2** during the movement of the boot;

FIG. **5** is a view similar to FIG. **1** according to another embodiment;

FIG. **6** is a view similar to FIGS. **1** and **5** according to another embodiment; and

FIG. **7** is a detailed view, on a larger scale, of FIG. **6**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. **1–5** show the assembly of the boot **2** and the binding apparatus **10** according to the invention, which is applied to the linkage of the boot to a gliding member such as a cross country ski **1**.

The cross country ski, in this case, is provided with the conventional aspect of a boot provided, on the lower surface of its sole, with a continuous longitudinal groove **3** adapted to cooperate with a continuous guiding rib or edge **11** of the binding device **10**.

Furthermore, this boot **2** has, at its front end, a transverse axis in the form of a pin or attachment member **4** arranged across the groove **3** and, set-back from the axis **4**, another transverse axis in the form of a pin or attachment member **5**, which is also arranged across the groove **3** and is located substantially at the level of the metatarsophalangeal journal zone of the foot, and at the most at the rear limit of the first third of the length of the boot which constitutes the rear limit of the metatarsophalangeal journal zone.

Of course, any position of the transverse axis **5** is possible between the front axis **4** and the rear limit defined hereinabove.

The front transverse axis **4** is adapted to cooperate, in a known manner, with a forwardmost attachment **12**, shown as a hook-shaped movable jaw, controlled by a lever **13**, and

the front edge **11***a* of the guiding rib constituting a fixed jaw, for the rotatable latching of the boot on the gliding member. Such a binding device is described, for example, in the previous patent FR 2 634 132 which is commonly owned, and can have a manual closure or a self-latching closure. Therefore, it will not be further described.

The binding device **10** further comprises a rearward attachment, shown in FIGS. **1–5** to include a connecting rod or member **15** which is housed within an associated recess and has an adjusted width **11***b* for the guiding edge (see FIG. **1**), and has at its free front end a hooked-shaped element or anchoring part **16** turned rearwardly and adapted to cooperate with the rear transverse axis **5** of the boot for anchoring the latter at this level. As shown particularly in FIG. **1**, the end of the hook **16** of the connecting rod has an enlarged form with respect to the remainder of the body of the connecting rod **15**, or order to better adjust to the width of the groove **3** associated with the boot in this area, and to contribute to the guidance of the boot in the raised position thereof.

As shown more particularly in FIG. **2**, the hook **16** has on its upper surface a ramp **16***a* adapted to facilitate the introduction therein of the transverse axis **5** of the boot.

The rearward attachment of the binding apparatus further includes the following. At its other end, the connecting rod **15** is journalled on the guiding edge **11** along a transverse axis in the form of a pin or axle **17**. The transverse journal axis **17** is further slidably mounted in the longitudinal direction with respect to the guiding edge **11**, in oblong guiding slots **18** provided within this edge.

Finally, a traction spring **19** is fixed on the axis **17**, on the one hand, and on a shoulder **20** of the guiding edge and elastically opposes any forward sliding movement of the connecting rod **15**, on the other hand.

Of course, the front and rear directions extend towards the front and rear of the ski, respectively, i.e. towards the left and right in the drawing, the longitudinal direction corresponding to the longitudinal direction of the sliding member or of the boot, and the transverse direction corresponding to a transverse direction of the sliding member/boot.

The functioning of the assembly according to the invention is as follows. First, the fitting of the binding apparatus is carried out, after its movable jaw **12** is opened by means of the lever **13**, by introducing the front axis **4** of the boot inside the housing demarcated by the movable jaw **12**, then by lowering the boot in the direction of the gliding member, its rear axis **5** sliding on the ramp **16***a* of the hook **16** until the axis **5** is engaged into the hook **16**, as shown in FIG. **3**. As is easily understood, such an engagement, will be made possible by a slight forward/rearward displacement of the hook **16**, which is made possible by the presence of the spring **19**.

Once the binding **10** is latched, as shown in FIGS. **3** and **4**, the boot is connected to the gliding member **1** through its two front and rear attachment members **4**, **5**, whereby the boot is pivotal about the axis extending through the forward attachment member **4**.

On the contrary, such a connection does not limit the movement of the boot, but in fact enables a controlled movement thereof.

Indeed, the sliding/rotating mounting of the connecting rod **15** allows for a displacement thereof in a substantially longitudinal plane, and in this scale, a vertical plane of the boot, enabling the connecting rod to follow the lifting and bending of the boot during the movement of the foot (see FIG. **4**) independent of the forward attachment **12**, the jaw of which maintains the axis of member **4** fixed with respect to the ski.

Furthermore, the return spring **19** exerts a continuous return force on the connecting rot **15**, and therefore on the boot **2**.

Thus, even in the positions of extreme movement of the boot, as shown in FIG. **4**, the latter will always be returned towards the ski by the hook **16**/connecting rod **15**/spring **19** assembly, and a constant control of the ski by the boot is obtained in all phases of the foot movement, which had not been the case until now.

Moreover, the integration of the connecting rod and of its return means within the guiding edge of the binding device makes it possible to clear the space at the front of the boot, and allows for an even larger forward rotational movement thereof.

The binding apparatus shown in FIG. **5** has an identical functioning, and the same elements will therefore be designated by identical reference numerals.

The only difference with respect to the apparatus of FIGS. **1–4** resides in the provision of an additional linkage member **21** between the two anchoring systems, this linkage member **21** being affixed to the movable jaw **12** and engaged with the connecting rod **115** by a hook-shape element **21***a* engaged with a hook **15***a* associated with the connecting rod.

This linkage member **21** makes it possible to drive the connecting rod **15** forwardly at the same time as the opening of the jaw **12**, and therefore to facilitate the disengagement and the exit of the rear axis **5** of the boot from the hook **16**.

Of course, the linkage member **21** does not interfere with the pivoting movement of the connecting rod **15**, the latter remaining totally free, and it only engages with the hook **15***a* thereof when the latter is in the lower position.

To facilitate the disengagement of the foot, a fixed vertical abutment **22** can be provided to project on the upper surface of the binding, in order to limit the forward movement of the axis **5** of the boot and allow for the disengagement in the vertical direction thereof, until it exits from the hook **16** during the opening of the binding apparatus.

In such an embodiment, the connecting rod **15** has, at its front end, i.e., at the level of the hoot **16**, a U-shape or cap-shape extending on both sides of the abutment **22**.

Furthermore, the connecting rod **15** has, at its rear ends, a vertical flat surface or cam surface **15***b* adapted to cooperate with the return spring **19** to limit the rotation of the connecting rod, and to favor its return to a resting position inside the recess **11***b* associated with the guiding edge from the lifting position, by a permanent return effect to such position.

The binding apparatus shown in FIGS. **6** and **7** has a functioning that is substantially identical to the binding devices of the previous Figures, and similar or identical elements will be designated by the same reference numerals increased by 100.

The essential difference with respect to the apparatus of FIGS. **1–5** resides in the provision of a compression spring **119**, instead of a traction spring, for the elastic return of the connecting rod **115**.

In this case, the compression spring **119** is mounted inside the guiding rib or edge **11**, between the journal **117** of the connecting rod **115**, on the one hand, and an abutment surface **120** of the guiding edge located at the front of the journal **117**, on the other hand.

As a result, the length of the connecting rod **115** and the center distance of axes **105–117** can therefore be increased with respect to the connecting rod **15**, of the previous embodiments.

The result is a much greater possibility for an angle of movement of the boot with respect to the ski, within equal distance from the journal axis **117** in the longitudinal direction.

Furthermore, this increase in the center distance of axes **105–117**, and therefore the corresponding modification of the lever arm between the two axes **105–117** enables a bias, and consequently an elastic response from the spring, which is closer to that obtained with a natural or synthetic rubber material, and therefore more comfortable.

As shown more particularly in FIG. **7**, the connecting rod, unlike the connecting rod **15** of the previous embodiments, is journalled on the guiding edge **111** outside of the latter, by means of its journal axis **117** slidably mounted in two lateral slots **111***b* of the edge.

Moreover, the journal axis **117** is housed in a semicircular transverse groove **141** of a bearing **140** which also serves as a support surface for the spring and comprises an axial projection **142** for guiding the spring **119** during its compression/extension movements.

The inside of the recess **111***b* of the guiding edge **111** which receives the spring **119** is encased in a metallic sheath **130**. This substantially cylindrical sheath **130** comprises two lateral grooves **131** opposite the grooves **111***b* of the guiding edge for the slidable mounting of the journal axis **117** and extends over the largest portion of the length of the recess **111***b*. The sheath **130** is merely slit longitudinally at its lower end **132** so as to avoid the direct contact of the spring **119** with the upper surface of the ski.

The role of this sheath **130** is multiple:

ensuring a resumption of forces and a protection of the inside of the edge against the spring and the forces transmitted by the axis **117**,

forming a cage narrowly surrounding the spring which guides it and limits any deformation and buckling thereof during its displacement, and makes it possible to guarantee the force stroke desired for the spring,

ensuring a protection against the upper surface of the ski by avoiding the deformations of the spring during its stroke,

maintaining the spring in position before the mounting of the binding on the ski (premounting effect).

It is also noted that the journal of the connecting rod **115** laterally on the guiding edge makes it possible to avoid the presence of an opening on the upper surface of the guiding edge, and consequently to guarantee a better imperviousness of the assembly, the edges and the openings **111***b* of the edge being covered by lateral walls **115***b* of the connecting rod.

Finally, in all the embodiments shown, the spring can be calibrated differently (by interposing calibration washers, quarter turn or screw calibration system, etc.) so as to modify the force curve of the spring and personalize it depending on the skier.

Of course, the present invention is not limited to an application to cross country ski, but can be used for any connection of a boot to a gliding member, including roller skates, while leaving the rear portion of the boot free to lift.

What is claimed:

1. A binding apparatus adapted to be affixed to an upper surface of a gliding element for binding a front portion of a boot to the gliding element, the boot having first and second longitudinally spaced attachment members at the front portion of the boot, a rear portion of the boot being free to be raised with respect to the gliding element, said binding apparatus comprising:

a forwardmost attachment adapted to releasably connect the first boot attachment member to the gliding element to facilitate pivoting of the boot about an axis fixed with respect to the gliding element;

a rearward attachment, rearward of said forwardmost attachment, adapted to releasably attach the second boot attachment member to the gliding element, said rearward attachment comprising:

an anchoring part structurally configured and positioned to engage the second attachment member of the boot;

an elastic return device continuously applying an elastic return force to said anchoring part to bias the boot in a direction toward the gliding element.

2. A binding apparatus according to claim **1**, wherein:

said rearward attachment includes a connecting member, said connecting member including said anchoring part;

said connecting member is mounted for movement with the boot independent of any movement of said forwardmost attachment.

3. A binding apparatus according to claim **1**, wherein:

said rearward attachment is positioned for attachment to the second boot attachment member in the metatarsophalangeal journal zone of the foot.

4. A binding apparatus according to claim **1**, wherein:

said rearward attachment comprises a longitudinally extending connecting member, said connecting member having a first end comprising said anchoring part, said elastic return device being connected to a second end of said connecting member.

5. A binding apparatus according to claim **4**, further comprising:

a longitudinally extending rib adapted to become seated in a longitudinally extending groove of the boot;

wherein said second end of said connecting member is connected to said rib by means of a transversely extending journal; and

wherein said rib further includes means for mounting said transversely extending journal for longitudinal sliding with respect to said rib, said elastic return device being connected to apply said elastic return force in opposition to said longitudinal sliding of said journal.

6. A binding apparatus according to claim **1**, further comprising:

a linkage element between said forwardmost attachment and said rearward attachment, said linkage element comprising means for simultaneously moving said forwardmost attachment and said rearward attachment to a release position.

7. A binding apparatus according to claim **5**, further comprising:

a fixed abutment provided at said rearward attachment, said fixed abutment comprising means for disengaging the second boot attachment member during movement of said rearward attachment to a release position.

8. A binding apparatus according to claim **4**, wherein:

said first end of said longitudinally extending connecting member is a front end and said second end of said longitudinally extending connecting member is a rear end, wherein said front end of said longitudinally extending connecting member is adapted to move vertically as the rear portion of the boot is raised with respect to the gliding element.

9. A binding apparatus according to claim **4**, further comprising:

a longitudinally extending rib adapted to become seated in a longitudinally extending groove of the boot, said rib including a lowermost surface adapted to be affixed to an upper surface of the gliding element;

said connecting member and said elastic return device being positioned, during use of the binding, above said lowermost surface of said rib.

10. An assembly of a boot and a binding apparatus for connecting a front portion of the boot to an upper surface of a gliding element, said assembly comprising:

a boot having a front portion, said front portion of the boot including first and second longitudinally spaced attachment members;

a binding apparatus comprising:

a forwardmost attachment adapted to releasably connect the first boot attachment member to the gliding element to facilitate pivoting of the boot about an axis fixed with respect to the gliding element, a rear portion of the boot being free to be raised with respect to the gliding element;

a rearward attachment, rearward of said forwardmost attachment, adapted to releasably attach the second boot attachment member to the gliding element, said rearward attachment comprising an anchoring member adapted to engage the second attachment member of the boot; and

an elastic return device, affixed to said binding apparatus, continuously applying an elastic return force to said anchoring member of said binding apparatus to bias said rear portion of the boot in a direction toward the gliding element.

11. An assembly according to claim **10**, wherein:

said axis extends through said first boot attachment member.

12. An assembly according to claim **10**, wherein:

said rearward attachment is positioned for attachment to said second boot attachment member in the metatarsophalangeal journal zone of the foot.

13. An assembly according to claim **10**, wherein:

said rearward attachment comprises a longitudinally extending connecting member, said connecting member having a first end comprising said anchoring member, said elastic return device being connected to a second end of said connecting member.

14. An assembly according to claim **13**, further comprising:

a longitudinally extending rib adapted to become seated in a longitudinally extending groove of said boot;

wherein said second end of said connecting member is connected to said by means of a transversely extending journal; and

wherein said rib further includes means for mounting said transversely extending journal for longitudinal sliding with respect to said rib, said elastic return device being connected to apply said elastic return force in opposition to said longitudinal sliding of said journal.

15. An assembly according to claim **14**, further comprising:

a linkage element between said forwardmost attachment and said rearward attachment, said linkage element comprising means for simultaneously moving said forwardmost attachment and said rearward attachment to a release position.

16. An assembly according to claim **14**, further comprising:

a fixed abutment provided at said rearward attachment, said fixed abutment comprising means for disengaging the second boot attachment member during movement of said rearward attachment to a release position.

17. An assembly according to claim **13**, wherein:

said first end of said longitudinally extending connecting member is a front end and said second end of said longitudinally extending connecting member is a rear end, wherein said front end of said longitudinally extending connecting member is adapted to move vertically as the rear portion of said boot is raised with respect to the gliding element.

18. A binding apparatus according to claim **13**, further comprising:

a longitudinally extending rib adapted to become seated in a longitudinally extending groove of the boot, said rib including a lowermost surface adapted to be affixed to an upper surface of the gliding element;

said connecting member and said elastic return device being positioned, during use of the binding, above said lowermost surface of said rib.

19. An assembly of a boot and a binding apparatus for connecting a front portion of the boot to an upper surface of a gliding element, said assembly comprising:

a boot having a front portion, said front portion of the boot including first and second longitudinally spaced attachment members;

means for binding the front portion of the boot to the gliding element, at the first attachment member of the boot, to allow pivotal movement of the boot about the first attachment member of the boot, and for allowing a rear portion of the boot being free to be raised with respect to the gliding element; and

means for applying a continuous elastic return force at the second attachment member of the boot, rearward of the first attachment member.

* * * * *